Astronomy and Astrophysics 2013 vol.550

Planck intermediate results: IV. the XMM-Newton validation programme for new Planck galaxy clusters

Ade P., Aghanim N., Arnaud M., Ashdown M., Aumont J., Baccigalupi C., Balbi A., Banday A., Barreiro R., Bartlett J., Battaner E., Benabed K., Benoît A., Bernard J., Bersanelli M., Bikmaev I., Böhringer H., Bonaldi A., Bond J., Borgani S., Borrill J., Bouchet F., Brown M., Burigana C., Butler R., Cabella P., Carvalho P., Catalano A., Cayón L., Chamballu A., Chary R., Chiang L., Chon G., Christensen P., Clements D., Colafrancesco S., Colombi S., Coulais A., Crill B., Cuttaia F., Da Silva A., Dahle H., Davis R., De Bernardis P., De Gasperis G., De Zotti G., Delabrouille J., Démoclès J., Désert F., Diego J., Dolag K., Dole H., Donzelli S., Doré O., Douspis M., Dupac X., Enßlin T., Eriksen H., Finelli F., Flores-Cacho I., Forni O., Frailis M., Franceschi E., Frommert M., Galeotta S., Ganga K., Génova-Santos R., Giraud-Héraud Y., González-Nuevo J., González-Riestra R., Górski K., Gregorio A., Gruppuso A., Hansen F., Harrison D.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

We present the final results from the XMM-Newton validation follow-up of new Planck galaxy cluster candidates. We observed 15 new candidates, detected with signal-to-noise ratios between 4.0 and 6.1 in the 15.5-month nominal Planck survey. The candidates were selected using ancillary data flags derived from the ROSAT All Sky Survey (RASS) and Digitized Sky Survey all-sky maps, with the aim of pushing into the low SZ flux, high-z regime and testing RASS flags as indicators of candidate reliability. Fourteen new clusters were detected by XMM-Newton, ten single clusters and two double systems. Redshifts from X-ray spectroscopy lie in the range 0.2 to 0.9, with six clusters at z > 0.5. Estimated masses (M500) range from 2.5 × 1014 to 8 × 1014 MM·. We discuss our results in the context of the full XMM-Newton validation programme, in which 51 new clusters have been detected. This includes four double and two triple systems, some of which are chance projections on the sky of clusters at different redshifts. We find thatassociation with a source from the RASS-Bright Source Catalogue is a robust indicator of the reliability of a candidate, whereas association with a source from the RASS-Faint Source Catalogue does not guarantee that the SZ candidate is a bona fide cluster. Nevertheless, most Planck clusters appear in RASS maps, with a significance greater than 2σ being a good indication that the candidate is a real cluster. Candidate validation from association with SDSS galaxy overdensity at z > 0.5 is also discussed. The full sample gives a Planck sensitivity threshold of Y500 4 × 10-4 arcmin2, with indication for Malmquist bias in the Y X-Y500 relation below this threshold. The corresponding mass threshold depends on redshift. Systems with M500 > 5 × 1014 MM at z > 0.5 are easily detectable with Planck. The newly-detected clusters follow the YX-Y500 relation derived from X-ray selected samples. Compared to X-ray selected clusters, the new SZ clusters have a lower X-ray luminosity on average for their mass. There is no indication of departure from standard self-similar evolution in the X-ray versus SZ scaling properties. In particular, there is no significant evolution of the YX/Y500 ratio. © ESO, 2013.

http://dx.doi.org/10.1051/0004-6361/201219519

Keywords

Cosmic background radiation, Cosmology: observations, Galaxies: clusters: general, Galaxies: clusters: intracluster medium, X-rays: galaxies: clusters